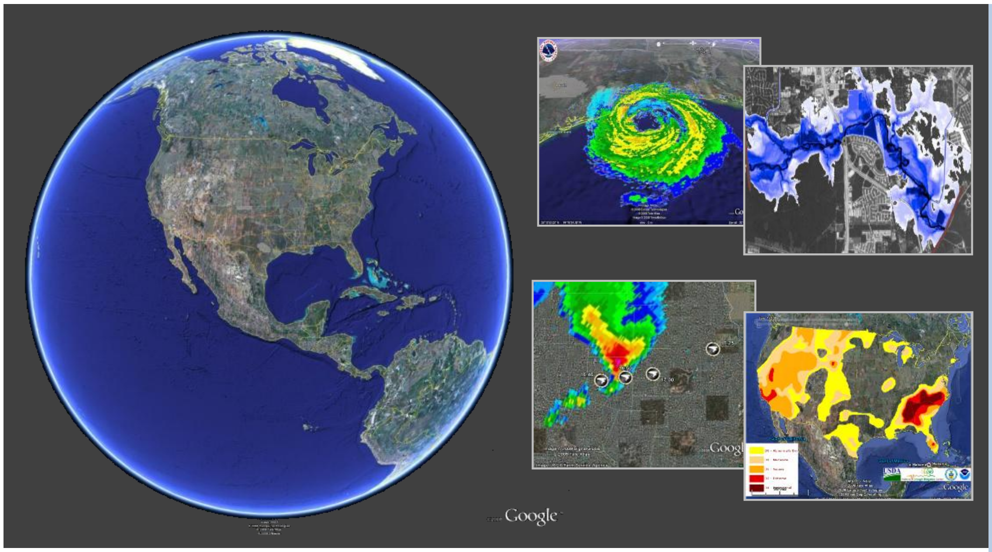
# NWS GIS/Google News

Fall 2009 Issue

Your source for sharing GIS & Google news, projects, and activities in the National Weather Service




### Topics in this issue:



## What's New?

### Changes to the newsletter

Welcome to this new edition of our newsletter! We have broadened the scope in order to better share information on a wider range of topics. Starting with this edition, we will include articles relating to Geographic Information Systems (GIS). Many offices are doing a lot of work with GIS, whether it is training, outreach, or local project development. This newsletter will now serve as an outlet for sharing GIS information and activities as well a platform to promote your work on this topic in addition to Google.

### Changes for the Google Maps API

**By: Keith Stellman - WFO Shreveport, LA**

Some things have recently come up within the Google Maps API that everyone should know about. These changes are very important for those that have developed or are planning to develop any Google Map displays.

1.) The Google Maps API key is no longer required. The NOAA Google Group recently went through a round of tech support with Google, and in the process they learned that for Maps API Premier, we no longer need to use the API key. Web pages from the following domains will automatically be allowed to load the API by just providing the client ID (gme-noaa):

- noaa.gov
- weather.gov
- aviationweather.gov
- mpa.gov
- dolphinsafe.gov

For example:

<script src="http://maps.google.com/maps?file=api&v=2&client=gme-noaa&sensor=false"
type="text/javascript"></script>

For more information on this change, check out Google's website at [http://googleenterprise.blogspot.com/2008/12/maps-without-keys.html](http://googleenterprise.blogspot.com/2008/12/maps-without-keys.html) for info about the discontinuation of keys for the API Premier.

2.) Invoking the maps API key using HTTPS/SSL: For the noaa.gov domain, the use of the Maps API over the HTTPS/SSL protocol has been enabled. This means that for any web site that ends in noaa.gov, you can embed a map in a secure page (for example, one that requires a username/password and encrypts all subsequent data passed).

## Google Earth

### *Utilizing Google Earth to Display a Database of Historical Flash Flood Events*

***By: Nanette Hosenfeld - WFO Salt Lake City, UT***

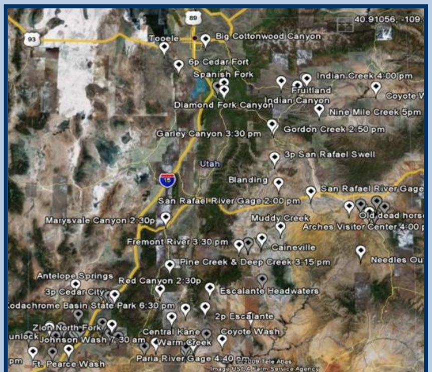



*Figure 1: Locations of flash flood events 2005 - 2008*

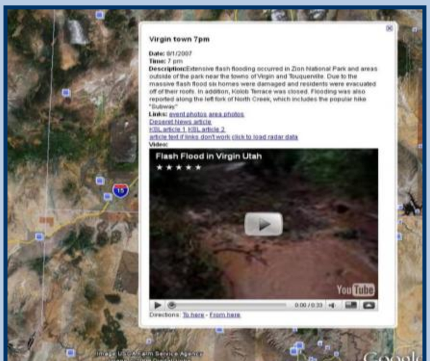



*Figure 2: Example of additional information available in placemarks*


*Figure 3: Example of an event photo accessed through the database*

In most locations, a third of an inch of rain falling in thirty minutes typically does not pose much of a hazard. However, on September 10th, 2008 it was enough rain to produce a flash flood in the Egypt - 3 slot canyon of southern Utah, resulting in two injuries and two fatalities. Within minutes, the slot canyon was filled with an estimated twenty feet of water, trapping those inside. Situations similar to this are becoming more common as the number of people venturing into flash-flood-prone areas in southern Utah grows. From 2000 to the present, Utah is among the fastest growing states and hosts over 9 million visitors per year to the state's five National Parks and two National Recreation Areas. This rapid population growth, combined with a significant at-risk population of individuals visiting the flash-flood-prone slot canyons and southern Utah backcountry will only serve to increase the threat associated with flash floods in coming years.

In response, multiple tools to assess the flash flood threat have been developed. One example is the Flash Flood Potential Rating Index (FFPI), developed by the Colorado Basin River Forecast Center (CBRFC). The FFPI rates a basin's flash flood threat based on its physiographic characteristics (e.g., slope, vegetation fraction, etc). While such tools have increased flash flood warning skill, they remain largely two-dimensional in nature. Google Earth provides a unique three-dimensional perspective of flash-flood-prone areas.

A historical flash flood database was created to take advantage of Google Earth's ability to plot and display information pertaining to these flash flood events. This database is expected to be an asset in training forecasters that are new to the area. They will be able to build expertise more quickly by becoming familiar with flash-flood-prone areas through the examination of historical events. Additionally, the database will be useful during warning operations. If forecasters are concerned about flash flooding, then they can overlay real-time radar data on the plotted database display. The forecaster can then quickly identify whether precipitation is falling in an area that has had flooding problems in the past. If so, they are able to see what precipitation estimates were associated with the previous flooding events.

To create the database, flash food events from 2005 to 2008 were identified from office records and the NCDC Storm Event Database. The location of each flash flood event during this period was plotted as a placemark in Google Earth **(Fig. 1)**. Each event placemark shows the date and time of the flash flood and provides a description of the event. When available, additional information was added such as affected roads, trails, or buildings. The drainages impacted by the flash flooding were also highlighted. Radar data, including one hour precipitation, storm total precipitation and reflectivity for each event was downloaded and aggregated into kmz loops, using the NOAA Weather and Climate Toolkit. This toolkit is available at the following web address: [www.ncdc.noaa.gov/oa/wct/install.php](www.ncdc.noaa.gov/oa/wct/install.php). The radar loops were then imported into Google Earth allowing forecasters to investigate precipitation estimates and the evolution of radar reflectivity associated with historic flash flood events. Any additional information, such as area and event photos, hydrographs, and area descriptions were linked in the placemark created for each event.

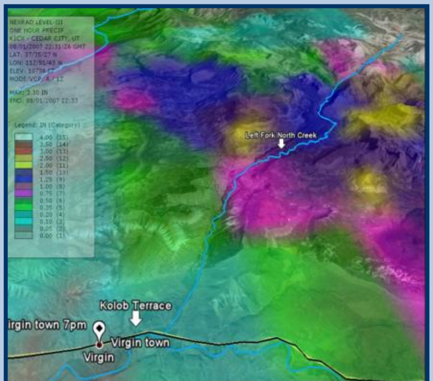



*Figure 4: One hour precipitation totals over the Left Fork of North Creek, leading into Virgin, UT*

To utilize the database in real-time, forecasters click on a placemark associated with a flood in an area of interest **(Fig 1)**. This will display more detailed information associated with the event **(Fig 2)**. In this case, an event description (from the Local Storm Report), photos and video of the event, photos of the affected drainage, and newspaper articles are available. By clicking on the "Radar Data" link (at the bottom of the Placemark pop-up), radar imagery and additional event location information are loaded into the user's "My Places" section of Google Earth. The user can then load the available radar loops for the event. Additional event location information, such as rivers, roads, cities, and popular recreation areas can also be loaded. By highlighting the impacted locations, forecasters can quickly identify which areas are affected when rain falls in specific drainages. **Figure 3** demonstrates the capability to view storm damage photos and area photos directly in Google Earth, when available.

Perhaps the most powerful feature of the database is the ability to view the location, amount, and intensity of the rainfall that produced the flooding. In cases like the August 2007 Virgin, Utah flash flood, for those familiar with hydrology in desert regions, it is readily apparent why a flash flood occurred. **Figure 4** depicts one hour precipitation over the area approximately two hours before the flash flood was reported. A broad area of three quarters to one inch of precipitation is concentrated along the North Creek drainage leading towards the town of the Virgin. Not all of the flash flood cases are this obvious; some cases have little rainfall accumulation, but flash flooding still occurred. The ability to compare historical precipitation amounts, intensity, and duration during an ongoing event is expected to be a great asset in the flash flood warning decision process.

## *Google Earth as a Fire Weather Forecasting Tool*

***By: Tim Brice - WFO El Paso, TX***

Google Earth (GE) has already proved its usefulness in helping forecasters monitor the weather, but additional capabilities of Google Earth will also make it even more valuable for meteorologists involved in fire weather forecasting. Wildfire behavior is influenced by the three elements that make up the wildland fire behavior triangle. The components of the triangle are: weather, topography and fuels. GE can be helpful in evaluating all three legs of the wildland fire behavior triangle.

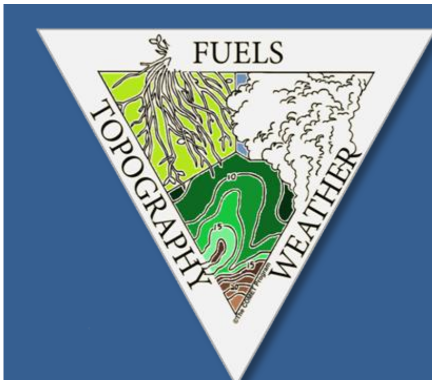



*Figure 1: Wildland fire behavior triangle*

When providing a spot forecast, it is important to understand what the weather has been like in the days and hours before the fire. With GE's time lapse feature, a forecaster can load a dataset of relative humidity and then loop it over time. The forecaster can also get a feel for how the relative humidity relates geographically with the spot location. Once a spot forecast is issued, it is important to maintain a weather watch on the spot location as rapidly changing weather conditions could affect the fire. GE's ability to overlay real time temperature, relative humidity, and wind values, along with real time radar data can help the forecaster stay on top of the situation as meteorological conditions at a fire site can quickly change.

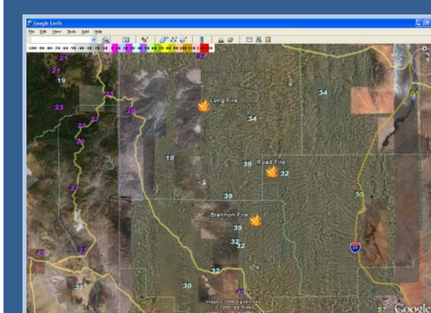


*Figure 2: Relative humidity observations in relation to spot forecasts*

Perhaps in no other weather forecasting area does topography play such an important role. Previously, if a forecaster wanted to understand the topography around a fire site they were limited to interpreting contour lines on flat maps. GE's ability to render hills and valleys in 3D allows the forecaster to have a more realistic perspective of the topography. A forecaster can actually go into a valley and see the different hills and drainages. Better understanding of the topography by the forecaster will ultimately yield better forecasts. Wind, temperature, and even cloud development locations are affected by topography.

Google Earth also allows forecasters to adjust the angle of the sun. This allows them to see when the sunlight will reach the fire site based on the slope aspect. Based on this information, the forecaster can adjust their temperature forecast.

A forecaster can even use GE to evaluate the fuels available at a certain spot location. However, caution is advised when using GE as the sole source for land cover/use information since GE's imagery can sometimes lag several years. Hence, it may not show a recent burn scar, new growth, or a new housing tract. However, for most areas wildland fuel changes are slow to occur over time. Nonetheless, attempts to obtain secondary confirmation of fuels should be made. This knowledge is invaluable when creating a forecast as wind speeds will vary greatly from in comparison of grasslands to a forest canopy. In addition, using GE access to archived imagery allows the forecaster to see how the fuels change from season to season and may show how civilization has crept into the wildland interface.

The danger of flash flooding associated with burn scars continues for many months and years after the fire has gone out. By overlaying the perimeter of the burn scar in GE's 3D environment, forecasters can see where potential flood runoff will go before heavy rain even develops. Once the rainfall develops, overlaying radar data on the 3D topography and the burn scar can provide the forecaster a very good spatial perspective as to where the rain is falling in comparison to the burn scar location. Questions that this strategy can help answer include:

- *Is one part of the burn scar receiving more rain than another part?*
- *Is the rain heavy or light over the most burned-over ground?*
- *Is it falling over the deeper terrain of the burn scare?*
- *What is downstream that may be more susceptible to flooding due to the increased runoff from the burn scar?*

These questions are better answered with the help of GE and its ability to overlay several meteorological data sets.

The 3D environment of GE and its ability to spatially display various weather elements can help forecasters better understand the environment near the spot location. Better understanding of each leg of the wildland fire weather triangle will lead to improved forecasts and better monitoring for the fire community.

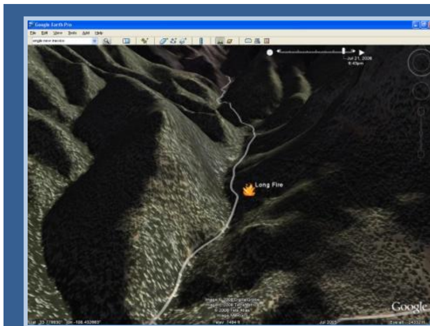


***Figure 3: 3D topography shows the hills and drainages around a spot location***

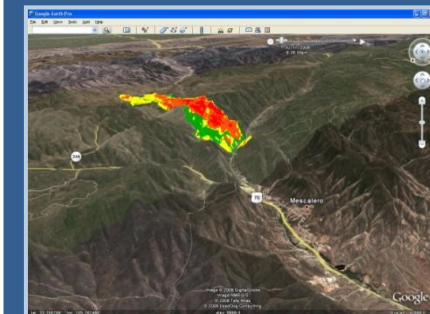


***Figure 4: Example of how burn scars can be better visualized through GE terrain display***


## Google Earth "Thanks" Report

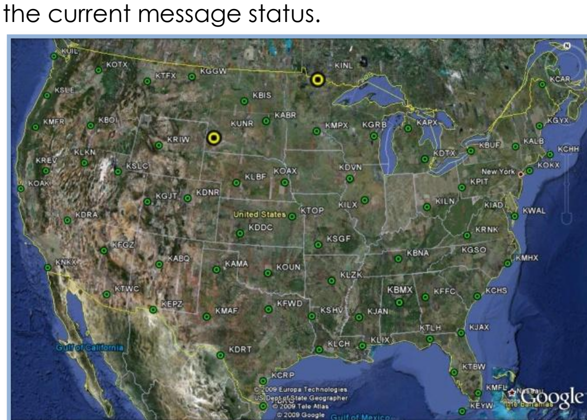
**By: Ryan Kardell - WFO Springfield, MO**

Traditionally, the message status of The National Weather Service's latest radiosonde flights can be found by examining the NCEP Upper Air Receipt Message, otherwise known as the "Thanks" report. The raw reports are available at **www.nco.ncep.noaa.gov/pmb/nwprod/thanks/** .
PHP scripting has been utilized to convert this text report into a kml file that can be displayed in Google Earth. Clicking the point for a particular radiosonde observation location will show the current message status.

- ***Green stations indicate all messages received***

- ***Yellow stations indicate partial messages received***

- ***Red stations indicate no messages received.***



This kml file may be found at:
**www.srh.noaa.gov/gis/kml/thanksreport/ThanksReport_AutoRefresh.kml**

# Google Maps

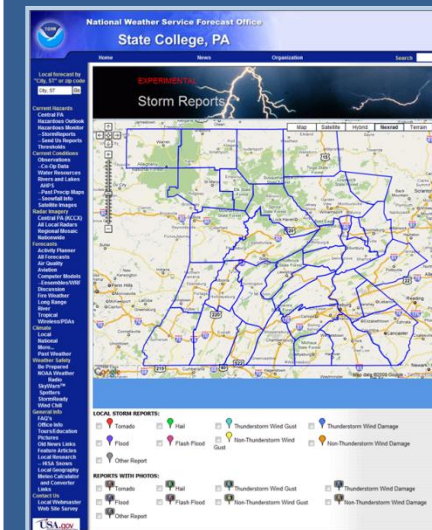
## *Plotting Local Storm Reports and Warnings with Google Maps*

***By: Ron Holmes – WFO State College, PA***

In recent years the NWS has started to provide latitude and longitude information in several products. Local Storm Reports (LSRs) include a lat/lon pair for the location of the report. Severe Convective Warnings include lat/lon pairs encompassing the warning polygon. In the past this information was plotted and displayed on a static map background. This served an initial purpose for quickly viewing approximately where the report or warning was located. However, more sophisticated users needed a way to drill down exactly to their location to determine the proximity of the warning or report.

The advent of Google Earth and Google Maps has increased the possibilities for rendering geographic data on a dynamic map. Using the Google Map API, storm reports and warnings are now plotted for a CWA during severe weather events. Every 5 minutes text products of LSR, SVR, TOR, and FFW are downloaded and decoded for 13 offices participating in the experiment. Then the information is stored in a MySQL database. During a severe weather event this information is plotted on a Google Map background centered over each CWA. The CWA county map background is also overlaid on the Google Map and a web page is made for each participating office. The right side of the web page contains links for the storm reports and warnings in chronological order that, when clicked, pan over to the location and display the detailed information of the LSR or warning via a pop-up window. Users can also click on various icons centered on the report or warning to display this information. In addition, current radar imagery is overlaid on the Google Map allowing users to see how real-time radar is responsible for the storm reports and warnings. The map updates continually throughout the day and events are archived on a calendar day basis. Users can view past events via links at the bottom of the page and can also visit other participating office's web pages via links to their page. When there is no severe weather occurring a blank map with the county background and current radar imagery is plotted.

The URL to the page is: ***www.erh.noaa.gov/ctp/lsr/ctp/***




*Local Storm Reports and Warnings Display*
*www.erh.noaa.gov/ctp/lsr/ctp*

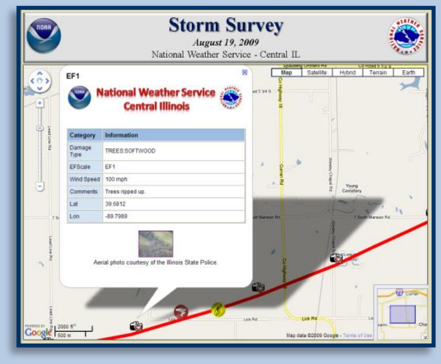
## *Enhanced Products and Services Through the Use of Google*

***By: Darrin Hansing – WFO Lincoln, IL***

You may have noticed that the National Weather Service in Lincoln and many other offices across the United States are starting to offer more and more enhanced products and services through Google Earth and Google Maps. These tools allow us to visually convey a wide variety of meteorological and hydrological information in a whole new way. We can now produce user interactive, dynamic products that were not available in the past.

One such example of this is in storm damage surveys. In the past, we produced basic, static maps of storm damage and tornado tracks as well as post a few pictures on our website. However, the Lincoln NWS office can now offer complete packages of storm damage survey information to the public through one simple Google Maps interface. This interface allows you to visualize tornado tracks, damage locations, damage impacts/information, storm photos and geospatial information in a map interface where you have control over where you go and what you see.

This Google storm survey on the August 19th tornadoes is our first use of this new tool. The links to these maps can be found on the write-up page for this storm event at ***www.crh.noaa.gov/ilx/?n=19aug09***.



Below you will find an overview of how to move within these maps as well as how to view the information.

- **Simple map controls**
  - Controls on the left side of the maps allow you to zoom in and out of the map as well as pan left, right, up, and down.
  - Left clicking and dragging your mouse will allow you to move in any compass direction.
  - The scroll button on your mouse will allow you to zoom in and out as well.

- **Easy to visualize icons**
  - Each icon symbolizes a point that contains storm survey information.
  - Click on the icon to display the information for that point. The key to these icons will always be found on the web page with the maps.
  - Icons with cameras show locations where storm damage and/or tornado pictures are available.
    - Once you click on the icon you will see thumbnail images of the available pictures.
    - Click on one of these images to open the full size picture in a web browser window.

- **Multiple map visualizations**
  - Options in the upper right hand portion of the maps allow you to visualize the map background in several ways.
    - **Map** (basic base map with roads)
    - **Satellite** (basic satellite overlay)
    - **Hybrid** (satellite overlay with labeled roads)
    - **Terrain** (topographic overlay)
    - **Earth** (displays the data in a Google Earth Browser plug-in)
  - These surveys are best viewed through the Google Earth visualization. In order to view it, you will be prompted by Google to install the plug-in for your browser.

# Geographic Information Systems

## *CWA Rankings by Population*

***Project by: Andy Hatzos - WFO Wilmington, OH***

***Population Methodology:***

ArcGIS was used to add up 2008 ESRI population estimates (by county) for all counties in each CWA, using the AWIPS CWA shapefile as a guide. Using this method, an "exact" population calculation for most CWAs was achieved. These CWAs are colored in white on the chart, and have the same "exact" population number in all three population columns.

However, some CWAs contain sections of "split" counties. These CWAs are colored in green on the chart. In these cases, the 2008 ESRI population estimates were used, but broke down the counties in question by census block. These smaller break-downs helped to identify census blocks that are definitively within the boundaries of one CWA, leaving less of an ambiguous population.

Where a CWA boundary crossed through a census block, the population of that block was declared "ambiguous". Calculations for a potential high and low population for each affected CWA were made based on that.

The population for WFO San Juan was calculated by adding the 2008 US Census estimate for Puerto Rico, and the 2008 US Census estimate for the US Virgin Islands.

The population and area for WFO Guam were calculated using 2009 CIA World Factbook estimates from Guam, the Northern Mariana Islands, the Republic of the Marshall Islands, the Federated States of Micronesia, and Palau.

The population and area for WSO American Samoa were also acquired from the 2009 CIA World Factbook estimates. The 2008 ESRI population estimates were acquired from the ESRI 2008 Data Update DVD.

***About the list:***

The list is sorted by the 'high' column.

In some cases, the 'high' value for one CWA may fall in between the high-low range of the preceding CWA. In these cases, the number in the 'high' column is colored in red. This represents an ambiguity in the rankings, but it is likely that the order of ranking is correct.

In one case, the 'average' value for a CWA is lower than the 'average' value of the CWA ranked above it. This case has the 'average' column colored in pink, and represents a more significant ambiguity in the rankings, and in this case, the rankings may in fact be incorrect.

Area is in square miles. Density is calculated using the 'average' population column, and is in persons per square mile.

| # | RG | ID | Office | High | Low | Average | Area | Density |
|---|---|---|---|---|---|---|---|---|
| 1 | E | OKX | Upton, New York | 18,478,818 | 18,478,818 | 18,478,818 | 6,388 | 2892.74 |
| 2 | E | PHI | Mount Holly, New Jersey | 11,874,518 | 11,874,518 | 11,874,518 | 15,306 | 775.81 |
| 3 | W | LOX | Oxnard, California | 11,759,325 | 11,759,325 | 11,759,325 | 12,059 | 975.15 |
| 4 | C | LOT | Chicago, Illinois | 10,405,190 | 10,405,190 | 10,405,190 | 14,169 | 734.36 |
| 5 | W | SGX | San Diego, California | 10,282,888 | 10,240,818 | 10,261,853 | 12,076 | 849.77 |
| 6 | E | LWX | Sterling, Virginia | 9,356,449 | 9,356,449 | 9,356,449 | 18,896 | 495.16 |
| 7 | E | BOX | Taunton, Massachusetts | 9,106,940 | 9,106,940 | 9,106,940 | 11,576 | 786.71 |
| 8 | S | FWD | Dallas, Texas | 7,864,430 | 7,864,430 | 7,864,430 | 39,358 | 199.82 |
| 9 | S | FFC | Atlanta, Georgia | 7,815,442 | 7,815,442 | 7,815,442 | 32,250 | 242.34 |
| 10 | W | MTR | Monterey, California | 7,484,560 | 7,484,560 | 7,484,560 | 11,348 | 659.55 |
| 11 | S | HGX | Houston, Texas | 6,372,256 | 6,372,256 | 6,372,256 | 20,361 | 312.96 |
| 12 | C | DTX | Detroit, Michigan | 6,236,768 | 6,236,768 | 6,236,768 | 11,652 | 535.25 |
| 13 | S | MFL | Miami, Florida | 6,006,762 | 6,006,715 | 6,006,739 | 9,988 | 601.40 |
| 14 | E | ILN | Wilmington, Ohio | 5,739,774 | 5,739,774 | 5,739,774 | 20,419 | 281.10 |
| 15 | E | CLE | Cleveland, Ohio | 5,706,377 | 5,706,377 | 5,706,377 | 14,663 | 389.17 |
| 16 | S | TBW | Tampa, Florida | 5,409,014 | 5,409,014 | 5,409,014 | 12,183 | 443.98 |
| 17 | W | STO | Sacramento, California | 4,832,597 | 4,817,109 | 4,824,853 | 28,429 | 169.72 |
| 18 | W | PSR | Phoenix, Arizona | 4,805,726 | 4,753,364 | 4,779,545 | 32,453 | 147.28 |
| 19 | E | GSP | Greer, South Carolina | 4,776,299 | 4,776,299 | 4,776,299 | 21,254 | 224.72 |
| 20 | W | SEW | Seattle, Washington | 4,603,119 | 4,603,119 | 4,603,119 | 20,268 | 227.11 |
| 21 | C | MPX | Chanhassen, Minnesota | 4,583,529 | 4,583,529 | 4,583,529 | 33,577 | 136.51 |
| 22 | E | RAH | Raleigh, North Carolina | 4,199,204 | 4,199,204 | 4,199,204 | 16,587 | 253.16 |
| 23 | S | EWX | San Antonio, Texas | 4,118,189 | 4,118,189 | 4,118,189 | 35,893 | 114.74 |
| 24 | S | SJU | San Juan, Puerto Rico | 3,918,450 | 3,918,450 | 3,918,450 | 3,570 | 1097.61 |
| 25 | S | MLB | Melbourne, Florida | 3,830,308 | 3,830,308 | 3,830,308 | 8,692 | 440.67 |
| 26 | E | PBZ | Pittsburgh, Pennsylvania | 3,825,572 | 3,825,572 | 3,825,572 | 19,050 | 200.82 |
| 27 | C | LSX | St. Louis, Missouri | 3,683,756 | 3,683,756 | 3,683,756 | 26,729 | 137.82 |
| 28 | E | AKQ | Wakefield, Virginia | 3,586,497 | 3,586,497 | 3,586,497 | 18,562 | 193.22 |
| 29 | C | BOU | Boulder, Colorado | 3,460,395 | 3,460,395 | 3,460,395 | 29,474 | 117.41 |

| # | RG | ID | Office | High | Low | Average | Area | Density |
|---|---|---|---|---|---|---|---|---|
| 30 | W | PQR | Portland, Oregon | 3,403,502 | 3,403,502 | 3,403,502 | 22,189 | 153.39 |
| 31 | E | CTP | State College, Pennsylvania | 3,369,899 | 3,369,899 | 3,369,899 | 23,352 | 144.31 |
| 32 | C | MKX | Milwaukee, Wisconsin | 3,269,175 | 3,269,175 | 3,269,175 | 11,980 | 272.89 |
| 33 | C | IND | Indianapolis, Indiana | 3,126,580 | 3,126,580 | 3,126,580 | 15,911 | 196.50 |
| 34 | S | LIX | New Orleans, Louisiana | 2,864,833 | 2,864,833 | 2,864,833 | 18,231 | 157.14 |
| 35 | E | BUF | Buffalo, New York | 2,862,802 | 2,855,236 | 2,859,019 | 12,899 | 221.65 |
| 36 | C | GRR | Grand Rapids, Michigan | 2,806,339 | 2,806,339 | 2,806,339 | 14,426 | 194.53 |
| 37 | W | HNX | Hanford, California | 2,777,869 | 2,777,869 | 2,777,869 | 26,521 | 104.74 |
| 38 | C | LMK | Louisville, Kentucky | 2,735,756 | 2,735,756 | 2,735,756 | 19,728 | 138.67 |
| 39 | S | MEG | Memphis, Tennessee | 2,726,495 | 2,726,495 | 2,726,495 | 31,159 | 87.50 |
| 40 | S | JAX | Jacksonville, Florida | 2,672,677 | 2,672,677 | 2,672,677 | 17,706 | 150.95 |
| 41 | W | SLC | Salt Lake City, Utah | 2,647,818 | 2,644,402 | 2,646,110 | 70,935 | 37.30 |
| 42 | S | BMX | Birmingham, Alabama | 2,637,746 | 2,637,746 | 2,637,746 | 28,318 | 93.15 |
| 43 | E | BGM | Binghamton, New York | 2,516,058 | 2,508,492 | 2,512,275 | 17,868 | 140.60 |
| 44 | C | EAX | Pleasant Hill, Missouri | 2,514,077 | 2,514,077 | 2,514,077 | 24,315 | 103.40 |
| 45 | S | MRX | Morristown, Tennessee | 2,477,404 | 2,477,404 | 2,477,404 | 16,439 | 150.70 |
| 46 | C | IWX | North Webster, Indiana | 2,385,779 | 2,385,779 | 2,385,779 | 16,042 | 148.72 |
| 47 | W | VEF | Las Vegas, Nevada | 2,377,213 | 2,357,881 | 2,367,547 | 69,741 | 33.95 |
| 48 | S | OHX | Nashville, Tennessee | 2,360,206 | 2,360,206 | 2,360,206 | 17,098 | 138.04 |
| 49 | S | OUN | Norman, Oklahoma | 2,313,378 | 2,313,378 | 2,313,378 | 48,048 | 48.15 |
| 50 | E | ALY | Albany, New York | 2,180,824 | 2,180,824 | 2,180,824 | 15,518 | 140.54 |
| 51 | S | TSA | Tulsa, Oklahoma | 2,132,913 | 2,132,913 | 2,132,913 | 25,978 | 82.10 |
| 52 | S | SHV | Shreveport, Louisiana | 2,073,976 | 2,073,976 | 2,073,976 | 35,712 | 58.08 |
| 53 | E | GYX | Gray, Maine | 1,874,399 | 1,873,700 | 1,874,050 | 19,961 | 93.89 |
| 54 | S | JAN | Jackson, Mississippi | 1,864,601 | 1,864,601 | 1,864,601 | 35,273 | 52.86 |
| 55 | E | RNK | Blacksburg, Virginia | 1,766,921 | 1,766,921 | 1,766,921 | 20,026 | 88.23 |
| 56 | E | CAE | Columbia, South Carolina | 1,732,471 | 1,732,471 | 1,732,471 | 13,658 | 126.85 |
| 57 | C | ILX | Lincoln, Illinois | 1,673,407 | 1,673,407 | 1,673,407 | 19,485 | 85.88 |
| 58 | S | TAE | Tallahassee, Florida | 1,658,763 | 1,658,763 | 1,658,763 | 24,733 | 67.07 |
| 59 | E | RLX | Charleston, West Virginia | 1,633,547 | 1,633,547 | 1,633,547 | 22,038 | 74.12 |
| 60 | S | LZK | Little Rock, Arkansas | 1,615,416 | 1,615,416 | 1,615,416 | 32,162 | 50.23 |
| 61 | S | LCH | Lake Charles, Louisiana | 1,612,047 | 1,612,047 | 1,612,047 | 19,892 | 81.04 |
| 62 | C | PAH | Paducah, Kentucky | 1,593,256 | 1,593,256 | 1,593,256 | 24,686 | 64.54 |
| 63 | S | ABQ | Albuquerque, New Mexico | 1,568,720 | 1,568,720 | 1,568,720 | 88,093 | 17.81 |
| 64 | S | MOB | Mobile, Alabama | 1,562,345 | 1,562,345 | 1,562,345 | 18,100 | 86.32 |
| 65 | C | OAX | Omaha, Nebraska | 1,489,793 | 1,489,793 | 1,489,793 | 22,119 | 67.35 |
| 66 | C | DVN | Davenport, Iowa | 1,489,313 | 1,489,313 | 1,489,313 | 20,280 | 73.44 |
| 67 | C | DMX | Des Moines, Iowa | 1,472,708 | 1,472,708 | 1,472,708 | 28,225 | 52.18 |
| 68 | E | CHS | Charleston, South Carolina | 1,448,759 | 1,448,759 | 1,448,759 | 11,429 | 126.76 |
| 69 | C | GRB | Green Bay, Wisconsin | 1,393,527 | 1,393,527 | 1,393,527 | 17,538 | 79.46 |
| 70 | P | HFO | Honolulu, Hawaii | 1,312,372 | 1,312,372 | 1,312,372 | 6,434 | 203.97 |
| 71 | C | SGF | Springfield, Missouri | 1,300,643 | 1,300,643 | 1,300,643 | 24,860 | 52.32 |
| 72 | W | TWC | Tucson, Arizona | 1,296,058 | 1,269,052 | 1,282,555 | 26,278 | 48.81 |
| 73 | S | BRO | Brownsville, Texas | 1,275,082 | 1,275,082 | 1,275,082 | 8,906 | 143.17 |
| 74 | E | ILM | Wilmington, North Carolina | 1,225,982 | 1,225,982 | 1,225,982 | 10,327 | 118.72 |
| 75 | W | OTX | Spokane, Washington | 1,150,157 | 1,150,157 | 1,150,157 | 39,077 | 29.43 |
| 76 | S | EPZ | El Paso, Texas | 1,114,180 | 1,114,180 | 1,114,180 | 30,632 | 36.37 |
| 77 | S | HUN | Huntsville, Alabama | 1,086,181 | 1,086,181 | 1,086,181 | 9,280 | 117.05 |
| 78 | C | ICT | Wichita, Kansas | 988,159 | 988,159 | 988,159 | 21,466 | 46.03 |
| 79 | C | PUB | Pueblo, Colorado | 983,737 | 983,737 | 983,737 | 32,885 | 29.91 |
| 80 | W | PDT | Pendleton, Oregon | 964,198 | 964,198 | 964,198 | 42,805 | 22.53 |
| 81 | S | CRP | Corpus Christi, Texas | 935,183 | 935,183 | 935,183 | 16,400 | 57.02 |
| 82 | C | ARX | LaCrosse, Wisconsin | 885,822 | 885,822 | 885,822 | 19,993 | 44.31 |
| 83 | W | BOI | Boise, Idaho | 852,523 | 852,523 | 852,523 | 49,588 | 17.19 |
| 84 | E | BTV | Burlington, Vermont | 839,264 | 839,264 | 839,264 | 15,641 | 53.66 |
| 85 | C | FSD | Sioux Falls, South Dakota | 813,558 | 813,558 | 813,558 | 28,547 | 28.50 |
| 86 | W | REV | Reno, Nevada | 777,329 | 760,532 | 768,931 | 35,677 | 21.55 |
| 87 | E | MHX | Newport, North Carolina | 766,104 | 766,104 | 766,104 | 8,079 | 94.83 |
| 88 | C | JKL | Jackson, Kentucky | 756,729 | 756,729 | 756,729 | 11,840 | 63.91 |

| # | RG | ID | Office | High | Low | Average | Area | Density |
|---|---|---|---|---|---|---|---|---|
| 89 | C | FGF | Grand Forks, North Dakota | 651,137 | 651,137 | 651,137 | 42,161 | 15.44 |
| 90 | C | TOP | Topeka, Kansas | 630,864 | 630,864 | 630,864 | 15,802 | 39.92 |
| 91 | C | APX | Gaylord, Michigan | 628,789 | 628,789 | 628,789 | 15,196 | 41.38 |
| 92 | W | MFR | Medford, Oregon | 616,645 | 615,336 | 615,991 | 37,304 | 16.51 |
| 93 | C | DLH | Duluth, Minnesota | 598,696 | 598,696 | 598,696 | 33,726 | 17.75 |
| 94 | W | FGZ | Flagstaff, Arizona | 574,860 | 573,747 | 574,304 | 50,269 | 11.42 |
| 95 | S | MAF | Midland, Texas | 552,699 | 552,699 | 552,699 | 50,955 | 10.85 |
| 96 | C | GJT | Grand Junction, Colorado | 551,764 | 548,348 | 550,056 | 51,393 | 10.70 |
| 97 | A | AFC | Anchorage, Alaska | 491,480 | 473,657 | 482,569 | 196,199 | 2.46 |
| 98 | P | GUM | Tiyan, Guam | 459,844 | 459,844 | 459,844 | 907 | 506.83 |
| 99 | S | LUB | Lubbock, Texas | 436,519 | 436,519 | 436,519 | 21,565 | 20.24 |
| 100 | W | PIH | Pocatello, Idaho | 424,593 | 424,593 | 424,593 | 31,182 | 13.62 |
| 101 | S | AMA | Amarillo, Texas | 411,391 | 411,391 | 411,391 | 26,235 | 15.68 |
| 102 | S | SJT | San Angelo, Texas | 402,232 | 402,232 | 402,232 | 26,935 | 14.93 |
| 103 | W | MSO | Missoula, Montana | 381,409 | 381,409 | 381,409 | 40,683 | 9.38 |
| 104 | C | BIS | Bismarck, North Dakota | 345,205 | 345,205 | 345,205 | 51,221 | 6.74 |
| 105 | W | TFX | Great Falls, Montana | 337,352 | 337,352 | 337,352 | 51,056 | 6.61 |
| 106 | E | CAR | Caribou, Maine | 331,137 | 330,438 | 330,788 | 20,043 | 16.50 |
| 107 | C | GID | Hastings, Nebraska | 304,730 | 304,730 | 304,730 | 19,402 | 15.71 |
| 108 | C | UNR | Rapid City, South Dakota | 272,778 | 272,778 | 272,778 | 41,667 | 6.55 |
| 109 | C | MQT | Marquette, Michigan | 267,061 | 267,061 | 267,061 | 14,210 | 18.79 |
| 110 | W | EKA | Eureka, California | 265,511 | 265,511 | 265,511 | 11,270 | 23.56 |
| 111 | W | BYZ | Billings, Montana | 257,015 | 257,015 | 257,015 | 41,354 | 6.21 |
| 112 | C | RIW | Riverton, Wyoming | 252,556 | 252,556 | 252,556 | 56,881 | 4.44 |
| 113 | C | CYS | Cheyenne, Wyoming | 250,868 | 250,868 | 250,868 | 35,883 | 6.99 |
| 114 | C | DDC | Dodge City, Kansas | 220,165 | 220,165 | 220,165 | 22,472 | 9.80 |
| 115 | C | ABR | Aberdeen, South Dakota | 183,014 | 183,014 | 183,014 | 30,528 | 5.99 |
| 116 | A | AFG | Fairbanks, Alaska | 143,833 | 127,868 | 135,851 | 347,714 | 0.39 |
| 117 | C | LBF | North Platte, Nebraska | 108,967 | 108,967 | 108,967 | 33,169 | 3.29 |
| 118 | W | LKN | Elko, Nevada | 90,144 | 89,495 | 89,820 | 56,035 | 1.60 |
| 119 | C | GLD | Goodland, Kansas | 80,240 | 80,240 | 80,240 | 21,004 | 3.82 |
| 120 | S | KEY | Key West, Florida | 76,364 | 76,317 | 76,341 | 163 | 468.35 |
| 121 | A | AJK | Juneau, Alaska | 72,301 | 70,443 | 71,372 | 38,744 | 1.84 |
| i | P | PPG | Pago Pago, American Samoa | 65,628 | 65,628 | 65,628 | 77 | 854.53 |
| 122 | W | GGW | Glasgow, Montana | 50,472 | 50,472 | 50,472 | 32,119 | 1.57 |

## Training and Outreach

### *Online Mapping Applications Course – Available Until Jun '10*

***by: Maren Stoflet - WFO Davenport, IA***


*The online course **Building WEB 2.0 Mapping Applications with ArcGIS Server and Google** Maps is now available through [www.crteacher.com/](http://www.crteacher.com/). The course has been purchased by NWS Southern Region, and is open to anyone that would like to sign up. Access to the course will be available until June 2010.*

***Building Web 2.0 Mapping Applications with ArcGIS Server and Google Maps*** is designed to teach you how to use the new ArcGIS Server JavaScript API, Google Maps API, and the ArcGIS JavaScript Extension for Google Maps to create Rich Internet GIS Applications (RIAs). Course participants will have access to a total of 6 modules including:

- Web 2.0 Concepts Applied to GIS
- Introduction to JavaScript
- Basic ArcGIS Server Concepts
- Programming ArcGIS Server with the JavaScript API
- Programming the Google Maps API
- Integrating ArcGIS Server with Google Maps

If you are interested in taking the course, you will need to obtain the enrollment key. For the enrollment key or any questions, please contact Maren Stoflet: maren.stoflet@noaa.gov

## GIS Day Activities Across the National Weather Service

- To better help promote GIS Day, an NWS "Top News" template was developed for those offices that wish to place it on their home page. This is a great way to educate the public on GIS. This newsletter as well as an outreach brochure is also made available via the "Top News" template.

- GIS team member B.J. Simpson from WFO Northern Indiana will give a presentation at the Second Annual University of Notre Dame GIS Day Symposium. The impact of GIS in the National Weather Service and NOAA will be the topic of the presentation. The new NWS GIS brochures will be distributed at the event.

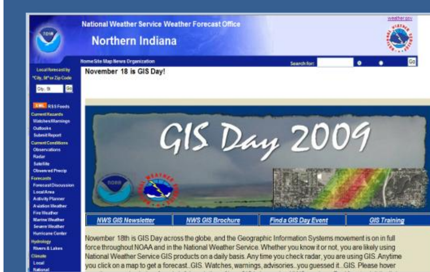
  GIS Day at Notre Dame will bring together researchers, local government agencies and businesses with the goal of building a community of interest around the display and manipulation of geospatial data.

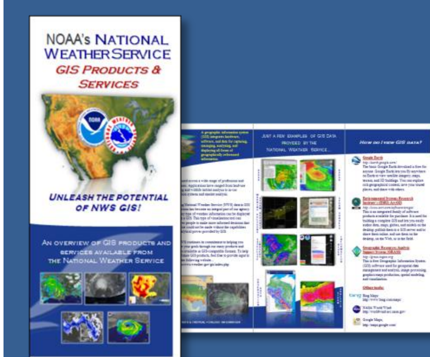
- GIS team members from the Pleasant Hill and Topeka WFOs will be hosting an information booth at The University of Kansas' GIS Day event. NWS Central Region GIS brochures will also be distributed at this event. In addition, real-time data from the NWS KML data page (http://www.weather.gov/gis/) will be displayed on laptop computers using Google Earth.

  A canned storm event such as the Greensburg tornado may also be developed to show how NOAA's Weather and Climate Toolkit can be used to create radar animations for display in GE. For more information on this application navigate to: www.ncdc.noaa.gov/oa/wct/index.php.

  Wendy Pearson from Central Region Headquarters will also be giving a presentation on the NWS Flood Inundation Mapping Program. Additional information regarding this event can be found at the following link: http://www.gis.ku.edu/gisday/2009/.

- **Please share your GIS Day activities, stories, and pictures with us for inclusion in our next GIS/Google newsletter! Please email Andy.Foster@noaa.gov & Darrin.Hansing@noaa.gov.**


### Web Sites of Interest:

***CR GIS Team Wiki:***
***https://collaborate.crh.noaa.gov/wiki/index.php/Central_Region_GIS_Team_Page***

***NWS GIS Resource Page:***
***http://gis.crh.noaa.gov/cr_resource.php***

***Google Earth Wiki:***
***https://collaborate.crh.noaa.gov/wiki/index.php/Google_Earth_Information***

***NWS KML Resource Pages:***
***http://intra.crh.noaa.gov/roc/***
***http://www.srh.noaa.gov/gis/kml/***

### CR GIS Support Team:

***Kris Lander (CRH)***
***Wendy Pearson (CRH)***
***Andy Foster (SGF)***

***Team Members:***
***http://gis.crh.noaa.gov/charter1.php***

### Google Support Team:

***Darrin Hansing (CR-ILX)***
***Andy Foster (CR-SGF)***
***Kris Lander (CRH)***
***Keith Stellman (SR-SHV)***
***Tim Brice (SR-EPZ)***
***CoreyPieper (SRH)***

### Article Submissions:

***Please send article ideas, project write-ups, web links or any other information you would like included in the next edition of the newsletter to the editor at: Darrin.Hansing@noaa.gov***